MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during March, 1886, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i. In tracing the centres of the paths of these storms data from the reports of one hundred and eighty-four vessels have been used.

The most noteworthy feature of the month on the north Atlantic was the remarkable continuation of low pressures; barometer readings below 29.0 were reported on thirteen days.

The general deficiency in the mean atmospheric pressure for March forms a noteworthy feature in the meteorology of the month, there being but one station in the United States where an excess over the normal is shown, viz., Red Bluff, California, .02 inch. There are two comparatively small areas where the pressure is normal—one in California and the other in South Carolina. In all other districts the pressure is below the normal; the deficiencies, however, are not marked, and are remarkably even over the entire country; the departures nowhere exceed .08 inch.

On chart i the centres of the paths of fifteen areas of low pressure, traced over the United States, are shown, this number exceeding by three the average for March during the last twelve years. Ten depressions are traced over the Atlantic.

The mean temperature is below the normal on the Pacific coast, in the Rocky Mountain districts, Missouri Valley, and in the Southern States; it is above the normal in the extreme northwest, upper lake region, and in Nova Scotia. The regions of maximum departure from the normal are the middle and southern plateau districts and the extreme northwest, the temperature averaging 3°.1 above the normal in the last-named district, and about 5° below the normal in the plateau districts.

The precipitation is largely in excess of the average in Florida, the east Gulf states, and in eastern Tennessee; quite a marked deficiency occurs in the lower Ohio valley, western Tennessee, and in portions of the central Mississippi valley. In other districts the departures from the normal precipitation are not unusual.

The very heavy rains during the closing days of the month in the Southern States resulted in damaging freshets in that section; the floods had not reached their maximum height at the end of the month.

As in the preceding month, a chart (number v) has been prepared, showing, for selected stations, the oscillations of atmospheric pressure and temperature during the month as noted at the tri-daily telegraphic observations.

The Chief Signal Officer has received from the Rev. J. E. Terberg, voluntary observer, Pekin, Tazewell county, Illinois, a series of interesting charts illustrating the atmospheric pressure, temperature, and other meteorological phenomena for March, 1886, at that place. Of the charts referred to, four are presented in this REVIEW, and will be found on the back of chart v; they exhibit (first) the mean temperature and "sun-heat," (second) the range of temperature, (third) the mean relative humidity, (fourth) the direction and force of the wind. In the plate representing wind data the Arabic numerals refer to dates; the Roman numerals indicate the force (scale not stated) of the wind; and the signs: •, —, +, indicate the hours of observation, viz., 7 a. m., 2 and 9 p. m., respectively.

In the preparation of this REVIEW the following data, received up to April 20, 1886, have been used, viz., the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and twenty-two Canadian stations, as telegraphed to this office; one hundred and forty-six monthly journals and one hundred and sixty-four monthly means from the former, and twenty-two monthly means from the latter; three hundred and ten monthly registers from voluntary observers; sixty-one monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the New England Meteorological Society, and from the local weather services of Alabama, Illinois, Indiana, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

ATMOSPHERIC PRESSURE.

[*Expressed in inches and hundredths.*]

The mean atmospheric pressure for March, 1886, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The mean pressure is greatest over the northern and central Rocky Mountain districts, and, as in the preceding month, it is least over the Canadian Maritime Provinces. Throughout the entire country the barometric means range from 29.73 to 30.15, the highest being reported from Montrose, Colorado, and the lowest from Sydney, Nova Scotia. Along the Pacific coast and in the Southern States, except in southern Texas, the mean pressures slightly exceed 30.0.

As compared with the mean pressure for the preceding month, a decrease is shown throughout the United States, except at Los Angeles and San Diego, California; at the former station no change occurs, and at the latter the mean pressure is .02 higher than for February. Over the greater part of the country the decrease exceeds .10, and over the central and southern Rocky Mountain districts it amounts to .20.

The departures from the normal pressure at the various Sig-

nal Service stations are given in the tables of miscellaneous meteorological data, and on chart iv they are shown by lines connecting stations of equal departure. The following stations report mean pressures which correspond with the normal for March: Charleston, South Carolina; Los Angeles, Sacramento, San Francisco, California; and Yuma, Arizona. At Red Bluff, California, the mean pressure is .01 above the normal. In all other parts of the country the pressure is below the normal for the month. The departures are remarkably even over the entire country; while they nowhere exceed .08 they are above .04 over the greater part of the country. All the lines on chart iv representing the departures indicate deficiencies of .05.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also shown in the tables of miscellaneous meteorological data. The monthly ranges are greatest in New England, where they vary from 1.22, at New Haven, Connecticut, to 1.62, at Eastport, Maine; they are least in Arizona and northern California. At stations in the Lake region the monthly ranges vary from 1.16 to 1.44.

The following are some of the extreme monthly ranges:

Greatest.		Least.	
	Inches.		*Inches.*
Eastport, Maine	1.62	Fort Grant, Arizona	0.46
Chicago, Illinois	1.44	Fort Thomas, Arizona	0.48
Milwaukee, Wisconsin	1.41	Fort Apache, Arizona	0.48
Portland, Maine	1.42	Yuma, Arizona	0.49
Grand Haven, Michigan	1.42	San Diego, California	0.53
Escanaba, Michigan	1.41	Los Angeles, California	0.57
Mackinaw City, Michigan	1.39	Key West, Florida	0.57
Alpena, Michigan	1.36	Prescott, Arizona	0.59

AREAS OF HIGH PRESSURE.

Ten areas of high pressure have been traced over the United States or adjoining territory during the month of March, 1886. Five of these areas originated to the west or northwest of the north Pacific coast; four were first observed on the east slope of the Rocky Mountains, north of the fortieth parallel; and one formed on the south Atlantic coast and passed northeast along the coast and disappeared to the northeast of Nova Scotia.

The high areas which originated to the west of the Rocky Mountains generally moved to the southeastward and disappeared before reaching the Mississippi Valley, except number viii, which continued its course to the southeastward and disappeared off the south Atlantic coast.

The direction of movement of those areas which originated on the east slope of the Rocky Mountains was also generally to the southeast or south, and all disappeared within the limits of the field of observation, with the exception of number x, which moved first southeastward, and after reaching the Mississippi Valley the course changed to northeast, following the general direction of the coast until it passed beyond the limits of observation.

Of the ten areas of high pressure observed during the month, seven disappeared within the limits of the field of observation; three passed over the Atlantic, and one, appearing on the north Pacific coast, apparently moved to the southwestward.

I.—This area is a continuation of that previously referred to in the February REVIEW, having appeared over Washington Territory or the north Pacific coast during the last days of the month, and from March 1st to 5th it remained almost stationary northwest of Lake Superior, gradually diminishing in energy. The highest barometer on the 1st was 30.77, at Prince Arthur's Landing, Province of Ontario; during the 5th it moved southward while low area number i passed eastward off the middle Atlantic coast, and on the following morning, the 6th, it was central in western Missouri; during the 6th it moved eastward into Tennessee, and disappeared on the 7th by a gradual decrease in pressure. The progress of this high area was not marked by specially low temperatures, except on the 1st at Canadian stations on the lakes and in the Saint Lawrence Valley, where the temperature ranged from 5° to 17° below zero.

II.—This high area first appeared in northern California; no special feature marked its course as it moved eastward over Utah on the 8th, during which day it probably united with high area number iii, which was at that time advancing eastward over northern Montana.

III.—Was first observed in northern Montana on the morning of the 8th; the highest reading of the barometer in that section was 30.33, at Fort Buford, Dakota, and the lowest temperature, —4°, at Fort Garry, Manitoba; on the morning of the 9th the pressure had increased to 30.41 at Fort Garry, Manitoba, and the temperature had fallen to —18° at Bismarck, Dakota. Snow was reported in Colorado, Missouri, Iowa, Wisconsin, and thence eastward to the lower lake region. During the 9th it passed rapidly southward to Arkansas, attended by quite low temperatures, but with no decided change in pressure near the centre. After reaching Arkansas its course changed to eastward, and the area passed off the south Atlantic coast on the 11th.

IV.—This area was first observed on the north Pacific coast on the 10th; it extended slowly over the plateau regions during the 10th, 11th, and 12th, moving to the southeastward, but the barometer fell rapidly, and it disappeared to the westward of the Rocky Mountains while a storm of considerable energy crossed to the eastward over British Columbia, north of Montana.

V.—This area also appeared on the north Pacific coast, being first observed in that region on the 14th; it moved southward over the coast line to southern California, and thence eastward over Arizona, and was central in northern New Mexico on the morning of the 17th, where it was last observed

VI.—This area of high pressure appeared off the south Atlantic coast on the morning of the 14th to the southwestward of a severe storm which had formed on the middle Atlantic coast, and was central near Cape Hatteras, North Carolina, on the morning of the 15th. The movement of this high area to the northeast can be clearly traced, although the greatest pressures observed were below 30.30. It passed over the continent and was central in the Ohio Valley during the 16th, after which it moved northeastward with increasing pressure, it having been re-enforced by a slight area of high pressure from the lower Missouri valley. The pressure increased to 30.30 on the 17th over New York, and on the 18th it passed over the Saint Lawrence Valley, attended by decreasing pressure, with areas of low pressure to the east and west; it probably disappeared in advance of the storm traced as number x, without passing to the east of the Saint Lawrence Valley. There was no decided fall in temperature observed within the limits of this area of high pressure.

VII.—Was at no time within the limits of the United States, although the reports from the northern stations show that it passed eastward and probably joined the high area previously described as number vi. It was central to the northeast of New England on the 20th, when it disappeared rapidly, owing to the advance of a low area of decided energy in the Lake regions. It first appeared north of Manitoba on the night of the 16th, and the barometer had risen to 30.40 at Fort Garry, Manitoba, by the morning of the 17th.

VIII.—Appeared off the California coast on the 18th, and on the 19th it extended over California, Oregon, and thence eastward to the central Rocky Mountain region. The movement was to the east and south, and areas of low pressure apparently existed to the north of Washington Territory and upper California; it passed directly eastward over the Rocky Mountain districts on the 20th, the pressure having increased from 30.20 to 30.30. During this movement eastward a storm of considerable energy was passing northeastward from the lower Missouri valley; on the morning of the 21st it was central in Wyoming and moved slowly southward, remaining

almost stationary and covering the Rocky Mountain regions until midnight of the 22d, when it moved rapidly to the upper Mississippi valley and thence eastward over the Ohio Valley, attended by generally fair weather. The barometric gradient was rapid both to the northeast and northwest on the 23d. When central in the Ohio Valley, storms of decided energy were passing off the Nova Scotia coast and approaching from the extreme northwest, while a second area of high pressure was advancing from the north Pacific coast. This area disappeared off the south Atlantic coast on the 25th.

IX.—This area appeared on the north Pacific coast on the 23d and extended rapidly eastward, following the storm which on that date was moving eastward north of Dakota and Montana; it extended over all districts west of the Missouri Valley by the 25th, the centre still remaining in Oregon, where the barometer registered 30.49. These conditions continued until the 26th when this area apparently divided, a portion passing to the eastward of the Rocky Mountains, north of the boundary of the United States, and was central north of Dakota, while the second high area remained on the north Pacific coast. The succeeding reports of the 26th showed that these areas united on the 27th and extended over the northern portion of the continent from the Saint Lawrence Valley to the Pacific coast, its centre being over Manitoba, where the pressure had increased to 30.70; these conditions continued until the 28th, the isobars being almost parallel to the degrees of latitude and the gradient quite rapid in a southerly direction throughout the United States. This condition was followed by the development of a storm in the west Gulf states, the gradual movement of a portion of this high area to the eastward over the Saint Lawrence Valley and the Maritime Provinces, and the formation of a second high area on the eastern slope of the Rocky Mountains.

X.—The midnight chart of the 28th indicated that the storm which was at that time forming in the Gulf of Mexico would advance northeastward, causing a division in the high area previously described by the advance of the barometric trough to the northeastward over the Lake region. On the afternoon of the 29th this area was clearly defined as central over the Missouri Valley, bounded by the isobar of 30.20; these conditions continued until the morning of the 30th, when this area had moved westward to the central Rocky Mountain region, the pressure remaining near 30.30. It extended northward during the 31st, covering the northern Rocky Mountain slope, and at midnight it was central north of Montana, the movement being apparently to the northeastward. Areas of high pressure extended southward to New Mexico, while a severe storm prevailed in the Lake region and generally throughout the Southern States. The west quadrant of the high area previously described could still be traced along the Nova Scotia coast, and reports from the Pacific coast announced the advance of a depression from the northern section of that region.

AREAS OF LOW PRESSURE.

Fifteen areas of low pressure have been traced on the tri-daily weather charts of the Signal Service during the month of March, 1886. Nine of these areas originated in the Rocky Mountain regions or on the Pacific coast, and nine passed as far east as the Atlantic coast. The general direction of movement was slightly to the south of east while the low areas were west of the ninetieth meridian, and it was slightly to the north of east after passing to the east of this meridian. Four areas of low pressure passed eastward north of the United States; four first became clearly defined as storm-centres on the eastern or middle slope of the Rocky Mountains, and two developed in the lower Rio Grande valley.

I.—This storm originated during the latter portion of February on the north Pacific coast, and on chart i in the WEATHER REVIEW for that month it was traced as far westward as W. 110°, the centre being north of Montana on the 23d. It moved to the eastward north of the Lake region and over the New England coast, causing severe gales, and on the 1st of March these gales continued along the Atlantic coast as far south as Hatteras, North Carolina, the centre of the storm being near N. 45°, W. 50°, where it remained from the 1st to the 5th, the barometer being below 29.00, and northwesterly gales continuing in the Maritime Provinces and on the Atlantic coast with unusual violence. After the 5th the barometer rose slowly at the northeastern stations, but the pressure did not reach normal in these sections until the 9th and 10th of the month.

The following notes from Signal Service observers are of interest:

New London, Connecticut: the series of gales which followed each other in rapid succession between February 25th and March 3d have no parallel in the records of this station for duration and severity. The timely warning was of great benefit.

Block Island, Rhode Island: high winds occurred at this station during the first three days of the month. The maximum velocity being forty-four miles on the 1st.

New York City: a severe northwest gale occurred on the 1st and continued until 10.13 p. m. of the 3d, the wind reaching a maximum velocity of fifty-four miles per hour on the 2d. Several accidents were reported in the city and harbor from the high wind.

Baltimore, Maryland: a severe gale occurred on Chesapeake Bay on the 2–3d, and but few vessels left port. The steamer "Richard Willing" was damaged by the gale to the extent of $2,000, and several schooners were reported ashore.

II.—On the first day of the month the barometer was below the normal on the California coast, in Arizona, and the Rio Grande Valley, and there were indications of an approaching storm from the southwest of Texas. The barometer continued low in this section, and at midnight of the 2d this storm was located as central near N. 25°, W. 101°; the centre could only be approximately located during the 2d and 3d, but the movement was directly to the east, attended by very heavy rains and severe easterly gales in the west Gulf states. Reports from the Gulf coast indicate that it moved directly east over the Gulf of Mexico during the 4th and 5th, causing very heavy rains on the east Gulf coast and in Florida, but the coast stations show no unusual wind-velocities attending this storm. After passing to the east of Florida it moved northward and probably united with the depression traced as number iii, after which the movement was to the eastward of the North Carolina coast.

III.—This low area is traced to the westward on chart i as far as W. 105°, being located as central in Colorado at midnight of the 3d. Reports received from the Rocky Mountain regions and the Pacific coast on the 2d indicate that this disturbance probably originated to the west of the Rocky Mountains. It moved eastward over Kansas during the 4th attended by light snows in the northern quadrant and light rains in the southern quadrant, the depression being slight and the barometer apparently rising at the centre. There was a slight movement to the northeast before reaching the Mississippi Valley, but the direction changed to southeast during the 5th and the depression became more extended as it passed over the Southern States. The morning report of the 6th showed a well-defined depression central near Wilmington, North Carolina, which probably resulted in the uniting of storms traced as numbers ii and iii. This storm was attended by high winds when first observed in the central Rocky Mountain region, but it lost energy as it moved eastward and caused only light showers over the Ohio Valley and northern portion of the Southern States.

IV.—This area was first observed far to the north of Montana on the afternoon of the 6th, when an extended high area covered the central valleys; it moved to the southeastward north of Minnesota, and by midnight of the 7th it was central near Escanaba, Michigan, where the barometer was below 29.70; at this report, the main area extended southward to the Gulf States and west over the Missouri Valley, the gradient being most rapid to the westward. The precipitation attending this storm in the Lake region and Northwest was light and in the form of snow north of the thirty-fifth parallel; it was followed by a cold wave on the 8th and 9th, which was most severe in the Mississippi and Missouri valleys. It moved over

the lower lake region and the New England coast, continuing its southeast direction until passing the Atlantic coast line when it apparently inclined to the eastward; light snows were reported in New England, New York, and the lower lake region previous to and after the centre had passed over these districts. The barometric readings at the centre of this disturbance varied but slightly from 29.70 during the time that it remained within the limits of the stations of observation, but it probably attained its maximum energy while central over Lake Superior. It was last observed as central near Boston, Massachusetts, on the morning of the 9th.

V.—This storm developed rapidly in northern Texas, where it was central on the morning of the 8th, when the storm described as number iv extended over the Lake region and a high area of considerable energy was moving southward from northern Dakota. These conditions continued until the morning of the 9th, the lake storm moving southeastward, the high area and cold wave moving southward, and low area number v moving eastward over the west Gulf states. The easterly movement continued during the 9th, attended by general rains in the Southern States, and after reaching the south Atlantic coast it apparently moved northeastward, and was last observed as central near Hatteras, North Carolina, on the afternoon of the 10th, at which report northerly gales were reported from the coast.

VI.—This area of low pressure was at no time central within the limits of the stations of observation and probably originated in the north Pacific; it was first observed on the afternoon of the 9th in N. 53°, W. 113°, and was last observed north of Quebec, Province of Quebec, at midnight of the 12th. The location of the centre is only approximately given, but the tri-daily reports serve to show the easterly movement. At midnight of the 11th it was central north of Lake Superior, and the trough of low pressure extended southward over Missouri, and in the southern portion of which the storm traced as number vii was central.

VII.—This storm developed over the central plateau region during the night of the 9th, immediately to the west of high areas which covered the central valleys and to the east of the high area which was at that time central off the north and middle Pacific coast, and to the south of the depression, previously described, which at that time was moving eastward north of Montana. The general direction of movement was to the eastward over Colorado and Kansas, inclining slightly to the southward until the centre reached eastern Kansas, when the direction changed to northeast. By the morning of the 10th the high area to the eastward extended over the Atlantic coast, and the high area to the westward had advanced over the northern Rocky Mountain region, but remained central on the north Pacific coast while this depression was central in western Kansas. It moved to the northeastward during the 12th, causing general rains in all districts during the 11th and 12th. The barometer continued to fall at the centre as it passed over the Lake region and the upper Saint Lawrence valley, the minimum pressure, 29.29, being observed at Montreal, Province of Quebec, at midnight of the 12th. A slight "norther" occurred in Texas while this storm was central in the Lake region, and high westerly winds prevailed on the middle Atlantic and New England coasts when it was moving over the Saint Lawrence Valley.

VIII.—This was a secondary depression which developed in the west quadrant of the storm previously described when it was passing over the upper lake region; it was first observed as central in western Minnesota on the morning of the 12th, and it moved southeastward as a slight depression during the succeeding twenty-four hours; it was last observed as a separate depression in northern Michigan on the afternoon of the 13th, although it probably united with a storm which was at that time moving along the Atlantic coast, but it is not so indicated on chart i.

IX.—The tri-daily reports received during the 12th indicated the presence of a disturbance off the south Atlantic coast, the barometer being unusually low over all districts east of the Mississippi. On the morning of the 13th this storm was apparently central on the middle Atlantic coast, and it moved rapidly northward over the New England coast during the succeeding sixteen hours, being central on the New England coast at midnight of that date. It was attended by severe gales on the New Jersey and New England coasts during the 13th and 14th and passed over the northeastern Canadian stations as a severe but rapidly moving storm and disappeared to the northeastward by midnight of the 14th.

X.—This storm developed in the upper Missouri valley during the 13th and moved southeastward to the lower Missouri valley. When first observed the depression was oval shaped, with the longer axis extending north and south, but after reaching the lower Mississippi valley the longer axis had changed direction and extended to the northeastward; the inclosing isobar of 29.70 extending from central Illinois to northern Texas, and the average width of the inclosed area being about one hundred miles. On the morning of the 15th the storm was moving to the northeastward over Illinois, and the oval shape of the depression extended in an east and west direction. It passed over the lower lake region on the 15th and was central in New England on the morning of the 16th. Light rains occurred throughout the northern districts, and high winds were reported from the middle Atlantic and New England coast stations after the centre had passed to the east of the coast line; it passed to the eastward south of Nova Scotia, and was last observed at midnight of the 16th central south of Halifax. During the night of the 15th high winds occurred at Eastport, Maine, and New York City, the maximum velocity in each case being thirty-six miles per hour, while that reported at Sandy Hook, New Jersey, was forty-four miles per hour.

XI.—This disturbance probably originated on the north Pacific coast and it has been traced to the westward of the one hundredth and twelfth meridian, its centre being approximately located north of western Montana at midnight of the 14th. It was at no time within the limits of the stations of observation, and did not reach the Atlantic coast, but after passing directly to the eastward as far as the eighty-fifth meridian, it apparently moved to the northeast and cannot be traced after the afternoon report of the 16th.

XII.—This area of low pressure also originated to the west of the Rocky Mountains. The tri-daily reports received on the morning and afternoon of the 16th indicated that it was central in western Montana at the 3 p. m. report of that date. It first became clearly defined at the midnight report of the 16th central in western Kansas; the depression was slight, however, the lowest isobar being 29.80. It moved eastward over Iowa and northern Illinois during the 17th, attended by light showers and causing no unusual disturbance, and disappeared by a gradual increase of pressure before reaching the Lake region.

XIII.—This storm has been traced from the California coast eastward to the Maritime Provinces, its centre being located at each of the tri-daily reports occurring between the afternoon of the 17th and the morning of the 23d. It apparently approached the coast from the northwest, moving in a southeasterly direction. At midnight of the 17th it was central southwest of San Francisco, California, and general rains prevailed in California, being unusually heavy in the southern portion of the state; it passed eastward over the central plateau region, Colorado, and Kansas during the 17th and 18th, causing light snows and rains at the central and southern Rocky Mountain stations. After passing to the eastward of the Rocky Mountains it increased in energy and the barometer fell at the centre. The easterly movement was rapid until the centre reached the Mississippi Valley, when the course changed to northeast and the movement was retarded. It moved slowly northeastward over the upper lake region, causing severe gales and general snows north of the Ohio Valley; it was followed by a high area from the Rocky Mountain region which increased the gradient in the west quadrant,

causing a "norther" on the Texas coast. After the storm-centre had passed and the wind had shifted to the northwest, the weather cleared rapidly, except in the lower lake region, where light snows continued until the 23d. After the centre reached the vicinity of Saugeen, Province of Ontario, its course changed to eastward, and the succeeding report (that of the morning of the 27th) placed the centre on the coast of Maine, near Eastport. The lowest reading of the barometer, 28.99, occurred at Anticosti, Province of Quebec, when this storm was central in that vicinity on the afternoon of the 23d. Severe gales occurred on the middle, south Atlantic, and New England coasts when this storm was central near Saugeen, and they continued from the northwest on the Atlantic coast after the storm had passed to the northeast of the Canadian stations on the 23d and 24th.

As this storm approached from the central Rocky Mountain region, indications of the probable occurrence of severe local storms were issued from the central office, and the following report from the observer at Cairo, Illinois, relative thereto, is given:

Special telegram announcing severe local storm for this district was received at 12.30 p. m. of the 20th, and was immediately posted in all bulletin frames, railroad companies, etc., notified, and the information telegraphed along the lines of the railroads running out of the city. Steamboats were tied up, railroad companies had their locomotives and cars moved to places of safety, river-men made their wharf-boats and barges secure, transfer boats were tied up and abandoned their trips, gardeners who had plants set out had a force of men employed to cover them with earth if the temperature should fall below the freezing point. Fresh southerly to high westerly winds occurred on the 20th, the maximum hourly velocity being forty-four miles per hour from the west at 9.35 p. m. All telegraph wires were in trouble, being mostly blown down, and but one wire could be worked between this city and Saint Louis, Missouri. Captain Taylor, of the "Gus Fowler," states that the rain fell in torrents at Metropolis, thirty-seven miles north of this city. It is estimated by the railroad companies and merchants that thousands of dollars worth of property were saved by the timely warning.

XIV.—This area of low pressure was observed far to the north of Montana on the 22d, and it passed eastward, inclining slightly southward until the centre had passed the Lake region, after which it followed the course of the Saint Lawrence Valley and disappeared to the east of the Atlantic coast after the 26th; it was no time central within the limits of the stations of observation. The area of high pressure which followed immediately to the west caused the barometer to rise rapidly in the Lake region, and brisk to high winds generally occurred at the lake ports, but the weather remained fair, with the exception of light local showers in the Ohio and central Mississippi valleys.

XV.—This disturbance developed south of Texas on the 28th, during which date the rain-area attending this storm had already extended over the Southern States. The barometer was high to the northeast of New England and north of Dakota, and as this storm developed and moved northward to the Ohio Valley it apparently separated the area of high pressure into two distinct areas, one remaining northeast and the second moving southward over the Missouri Valley. The low area moved slowly northward, causing very heavy rains in the Southern States, especially in Alabama, Georgia, and Tennessee. On the morning of the 30th it apparently divided into two separate low areas, one central near Louisville, Kentucky, and the other central near Mobile, Alabama, and heavy rains continued in the Southern States. These two depressions moved slowly northeastward during the succeeding eight hours, and had united over central Kentucky at the midnight report of the 30th. The northerly movement continued during the 31st over the Lake region, the centre passing over Lake Huron. Severe local storms occurred in all districts east of the Mississippi Valley during the 30th and 31st, and the destructive freshets which occurred in the southern rivers were due to the rains attending this depression.

The following notes relative to this storm are taken from reports of Signal Service observers:

Cairo, Illinois: Captains of river steamers state that the high winds and fine snow that occurred during the night of the 30th–31st made it one of the roughest nights ever experienced on the river.

Chattanooga, Tennessee: a heavy rain fell throughout the 31st, the total precipitation, 5.95 inches, being the greatest amount that has fallen in the same time since the establishment of this station in 1879. Brisk to high westerly winds occurred on the 31st, with flurries of snow.

Knoxville, Tennessee: the total rainfall for the thirty-nine and a half hours ending at 8.38 a. m. of the 31st, 6.56 inches, is the heaviest single rainfall on record since the unprecedented rainfall (8.10) of February 24–26th, 1875.

Milwaukee, Wisconsin: a brisk northerly gale occurred on the 31st, accompanied by frequent changes of rain, sleet, and snow at intervals during the day.

Rochester, New York: a severe westerly gale occurred on the 31st, attended by cloudy and rainy weather.

Smithville, North Carolina: a southerly gale began at 9.50 a. m. of the 30th and reached its maximum velocity, forty-two miles per hour, at 7.45 a. m. of the 31st. Considerable damage was done to the fruit blossoms in this vicinity, and the damage throughout the county is estimated at $5,000. Much praise was bestowed on the Signal Service for the timely warning of the gale, during the prevalence of which five steamers and eleven sailing vessels remained in harbor.

Fort Macon, North Carolina: a heavy southeast gale occurred on the 31st, producing heavy seas; the wind reached a maximum velocity of forty-two miles per hour.

Atlanta, Georgia: the heavy rains that occurred during the last few days of the month ended during the night of the 31st, and the damage by the resulting floods has never before been equalled in this part of the country. The rain was succeeded by high winds which reached a maximum velocity of thirty miles per hour on the 31st.

Savannah, Georgia: a heavy thunder-storm occurred during the early morning of the 31st, accompanied by high winds. Severe storms and floods were reported throughout the state, and great damage was done to crops.

Jacksonville, Florida: a severe gale and thunder-storm occurred on the 31st, the wind reaching a maximum velocity of thirty-four miles per hour from the west. No damage was reported.

Cedar Keys, Florida: a severe thunder-storm passed over this station on the 31st, moving from west to east, accompanied by intense lightning, heavy rain, and a decided fall in temperature, the wind reaching a maximum velocity of thirty-two miles per hour.

The following table gives the latitude and longitude in which the centre of each area was first and last observed, and the average hourly velocity:

Low areas.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I			48 00	57 00	
II	25 00	101 00	33 00	76 00	25.0
III	39 00	105 00	33 00	76 00	27.0
IV	53 00	105 00	42 00	67 00	30.0
V	34 00	102 00	33 00	74 00	34.0
VI	53 00	113 00	50 00	72 00	31.0
VII	41 00	109 00	48 00	62 00	40.0
VIII	47 00	96 00	44 00	85 00	20.0
IX	38 00	75 00	46 00	59 00	34.0
X	47 00	105 00	42 00	63 00	32.0
XI	54 00	114 00	52 00	83 00	35.0
XII	47 00	113 00	43 00	89 00	44.0
XIII	38 00	124 00	50 00	62 00	28.0
XIV	54 00	109 00	50 00	63 00	26.0
XV	28 00	95 00	47 00	80 00	29.0

NORTH ATLANTIC STORMS DURING MARCH, 1886.

[*Pressure in inches and millimetres; wind-force by Beaufort scale.*]

The paths of the depressions that have appeared over the north Atlantic Ocean during the month are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and other data collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data, received at this office up to April 20, 1886.

Of the ten depressions traced during the month, five, viz., numbers 1, 4, 6, 7, and 9, are continuations of storms which entered the Atlantic from the North American continent; number 2 is a continuation of an area of low pressure which was central in the ocean near W. 25°, N. 50°, at the close of February; numbers 3 and 10 originated in the mid-Atlantic; and numbers 5 and 8 appeared in the vicinity of the Bermudas. The general direction of movement of these storms was northeasterly and easterly, with exception of number 8, which is